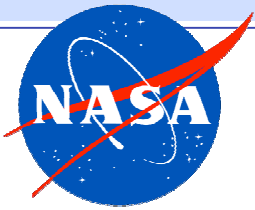# Building a Healthy Learning Organization at the NASA Goddard Space Flight Center

Dr. Edward W. Rogers
Office of Mission Success
November 8, 2005
ISHEM Conference
Napa, CA

Mission Success — Safety, Team work, Integrity

A Healthy Learning Organization

- Knows how to process knowledge
  - Davenport, Information processing into usable knowledge
- Appreciates the value of shared knowledge
  - Hayek, dispersed collective knowledge is the most valuable
- Evolves with knowledge use
  - Fulmer, Shaping the Adaptive Organization
- Encourages meaningful subject matter interaction
  - Novak, self directed learning behavior
- Facilitates meaningful human to human interaction
  - Argyris, stimulate human learning capacity
- Loads Local units with knowledge
  - Pfeffer, KM is not an upward extraction process
- Rewards local sharing and reapplication
  - Rogers, Innovation and solution finding are intrinsic motivators
- Shares knowledge across usability lines, not reporting lines
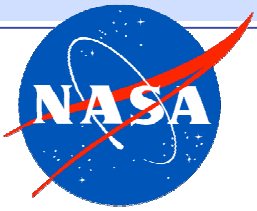 - Wegner, Communities primarily help each other (not management)
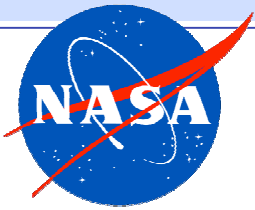
Not a Learning Organization

"Shuttle management declined to have the crew inspect the Orbiter for damage, declined to request on-orbit imaging, and ultimately discounted the possibility of a burn-through."

"The Board views the failure to do so as an illustration of the lack of institutional memory in the Space Shuttle Program that supports the Board's claim… that NASA is not functioning as a learning organization."

CAIB Report (2003) Section 6.1, Page 127

"NASA's culture of bureaucratic accountability emphasized chain of command, procedure, following the rules, and going by the book. While rules and procedures were essential for coordination, they had an unintended but negative effect. Allegiance to hierarchy and procedure had replaced deference to NASA engineers' technical expertise."

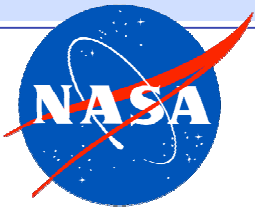CAIB Report Vol 1, Section 8.5, Page 200
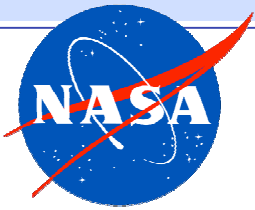
Accepting Risk

"When a program agrees to spend less money or accelerate a schedule beyond what the engineers and program managers think is reasonable, a small amount of overall risk is added. These little pieces of risk add up until managers are no longer aware of the total program risk, and are, in fact, gambling."

CAIB Report Vol 1, Section 6.2, Page 139

Blocked Communication

"The organizational structure and hierarchy blocked effective communication of technical problems. Signals were overlooked, people were silenced, and useful information and dissenting views on technical issues did not surface at higher levels. What was communicated to parts of the organization was that O-ring erosion and foam debris were not problems."

CAIB Report Vol 1, Section 8.5, Page 201
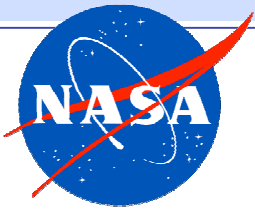
Not Functioning as a Learning Organization?

- The Organization accepts unintended consequences

  Changes in classification of foam anomalies improved schedule but were detrimental to safety.

- The Organization stumbles over itself

  Engineering opinion was controlled by stifling demand for rule adherence to the point where no images were obtained of the orbiter.

- The Organization lacks capability for error correction

 *Safety organization failed to operate as an error correction mechanism.*
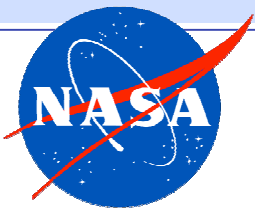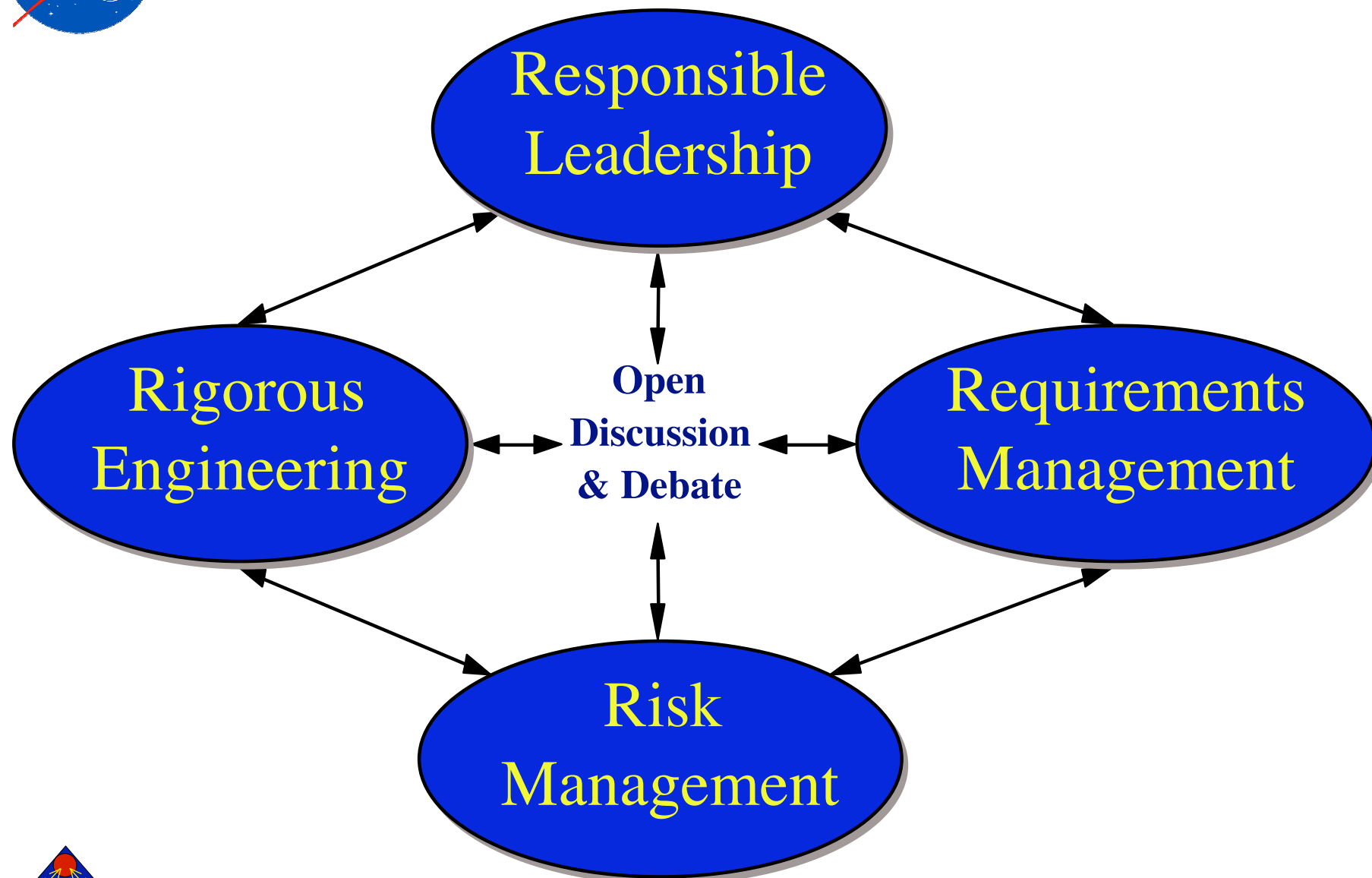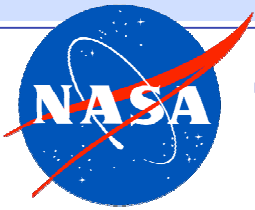
The KM Problem at the Project Level

- ## Not Reliable

  1. Designer dependent outcomes (team make up determines team outcome as much as team function or structure)
  2. Organizational communication processes introduce risk to system (redundancy, reliability delusions, stress points)
  3. Knowledge loops are longer than operational throughput cycle time (knowledge is not timely in application)

- ## Not Sustainable

  1. Social networks are decaying faster than they are being reproduced
  2. Knowledge sharing legacy systems are not built around today's workplace structures
  3. Mentors have a time-space gap with Mentees for effectively sharing knowledge
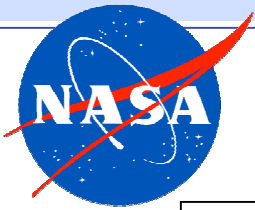
Goddard's Learning Plan

Building the Goddard Learning Organization:
A strategic plan for managing our collective knowledge and changing our culture to help GSFC function more like a learning organization
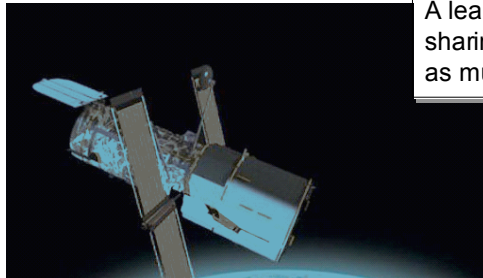
A learning organization facilitates the sharing of knowledge among people as much as among systems.

The Challenge to Change
The Need for a Plan to Manage Knowledge and Build a Learning Organization at NASA has been highlighted in a number of official documents. This Plan for GSFC is in direct response to these

"The Goddard Plan is designed to overcome the previous Agency focus on IT as a KM driver with its over-emphasis on *capturing knowledge from workers* for the organization and instead focuses on facilitating *knowledge sharing among workers*."

p5 of draft

Goddard Learning Plan

Future Goddard projects should never accept risk or experience failure because the organization did not apply its own best knowledge.

Goddard must not sit by expecting our successes of the past to carry us through the times ahead.

[1] *Strategic Plan for Knowledge Management*, NASA Knowledge Management Team, April 2, 2002 (unsigned draft document) available on the NASA KM website at: http://www.km.nasa.gov/home/index.html
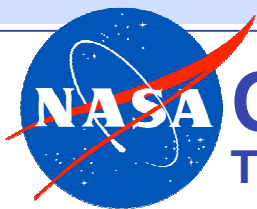
Goals of Learning Plan

1. Build a Learning Organizational Culture
2. Manage Knowledge Assets Efficiently
3. Facilitate Effective Knowledge Application

Learning Practices

1. Pause and Learn
2. Sharing Workshops
3. Case Studies
4. Lessons Learned
5. Training & Development
6. Design Rules

Open Loop Lessons Learned

Capture is the Key Word

Individual Knowledge Worker

Individual Knowledge Worker

Individual Knowledge Worker

Individual Knowledge Worker

Focus is on Deploying the LL Tool Set

Agency Lessons Learned Information System

Individual Knowledge Worker

Individual Knowledge Worker

Individual Knowledge Worker

Individual Knowledge Worker

Local Loop Learning Process
People Process Driven Approach

Share is the Key Word
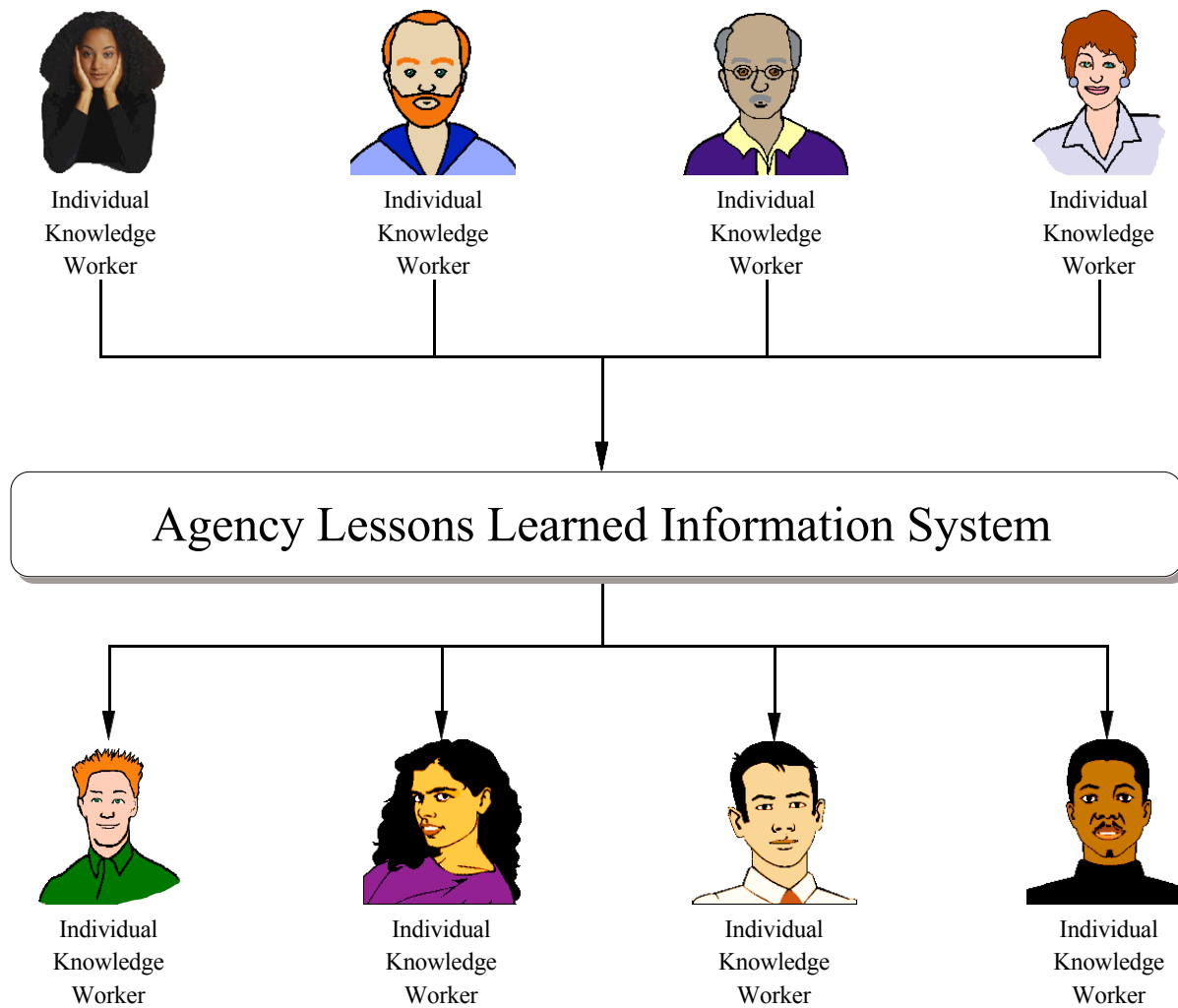
Focus is on Learning in the Work Group

Individual Knowledge Worker

Individual Knowledge Worker

Project Team PFL Process

Individual Knowledge Worker

Individual Knowledge Worker

Knowledge Sharing Workshop

Individual Knowledge Worker

Project Team PFL Process

Individual Knowledge Worker

Case Study

Individual Knowledge Worker

Individual Knowledge Worker

Project Insights & Lessons

MSR Notes, RM Trends, GIDEP etc.

Center Common Lessons Learned Process

Project Reviews & Incidents

recommendations for changes to

Directives & Procedures

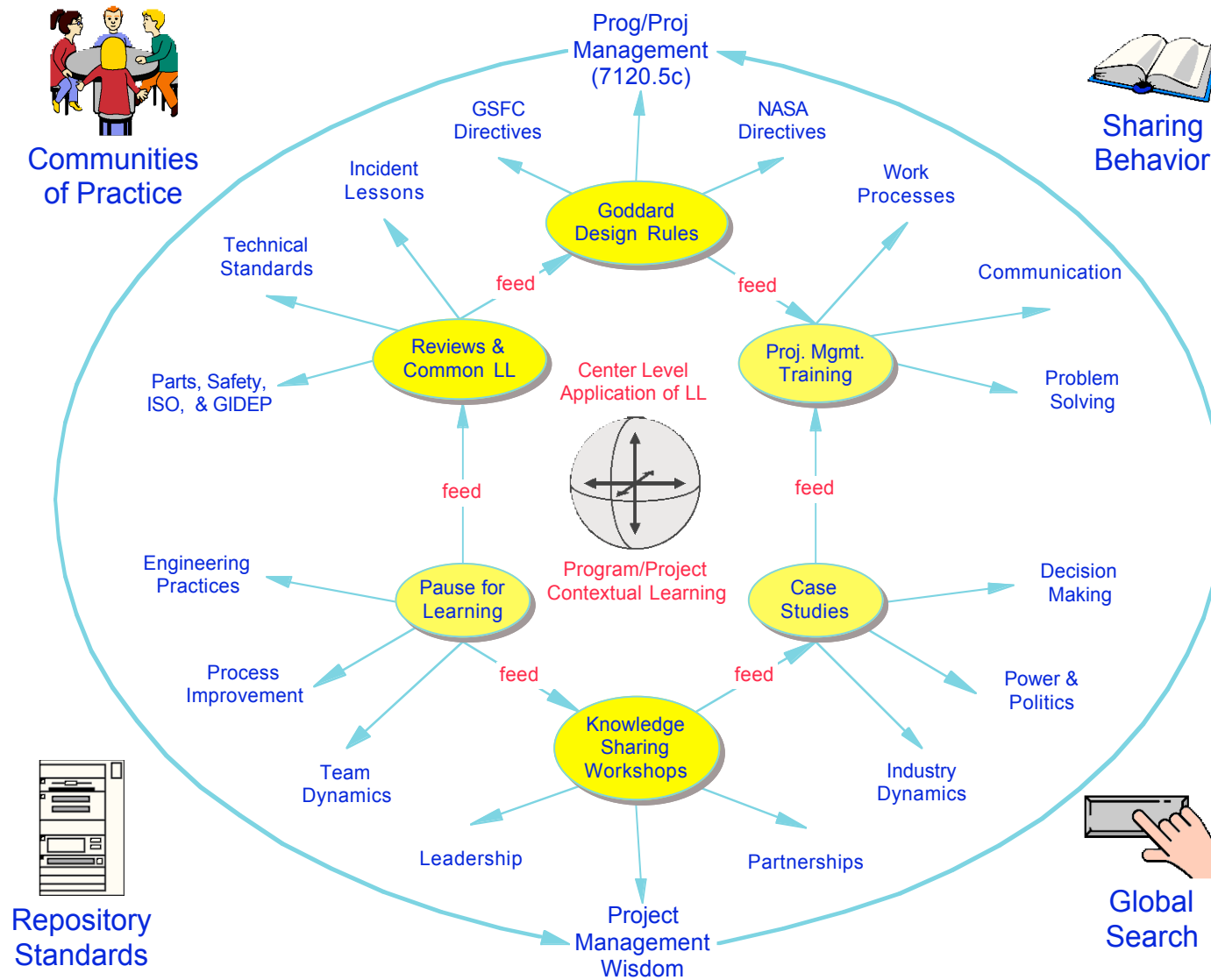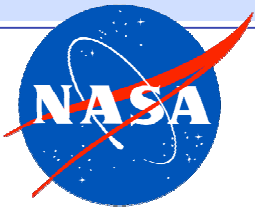Training & Leadership

Goddard KM Architecture

Lessons Building Learning in the Army

1. The knowledge of the Army profession resides primarily in the minds of its members.

2. Connecting members allows the knowledge of the profession to flow from those who know to those who need to know, from those with specific experience to those who need that experience right now.

3. ***Person-to-person connections and conversation allow context and trust to emerge and additional knowledge to flow***.

4. Relationships, trust, and a sense of professional community are critical factors that set the conditions for effective connections and convesations.

From <u>Company Command</u> by Nancy Dixon, et.al. (2005). Center for Advancement of Leader Development and Organizational Learning. p21.
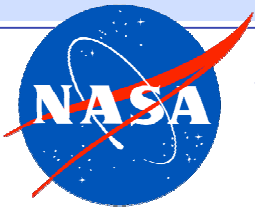
Why Knowledge Sharing Efforts Fail

1. Knowledge management efforts mostly emphasize technology and the transfer of codified knowledge,
2. Knowledge management tends to treat knowledge as a tangible thing, as a stock or quantity, and therefore separates knowledge as something from the use of that thing,
3. Formal systems can't easily store or transfer tacit knowledge,
4. *The people responsible for transferring and implementing knowledge management frequently don't understand the actual work being documented*,
5. Knowledge management tends to focus on specific practices and ignore the importance of philosophy.

From The Knowing-Doing Gap: How smart companies turn knowledge into action by Jeffrey Pfeffer and Robert Sutton. (1999). Harvard Business School Press. Page 22.
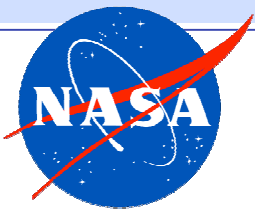
Lessons Learned About Lessons Learned

"A second generation KM Architecture must show how learning will occur across the organization to produce a continuous knowledge supply, not just how current knowledge will be efficiently harvested with no thought to replenishment. Sustainment must be part of the design if the results are to last longer than the current version of KM software deployed. All three phases of the knowledge life cycle must be supported: knowledge production, knowledge diffusion and knowledge use. *As smart as a KM system may be, it will never be smart enough to fool the people expected to use it*."

McElroy, M.W. (1999). Double-Loop Knowledge Management, MacroInnovation Inc. Available from www.macroinnovation.com